

METI's effort to realizing autonomous driving

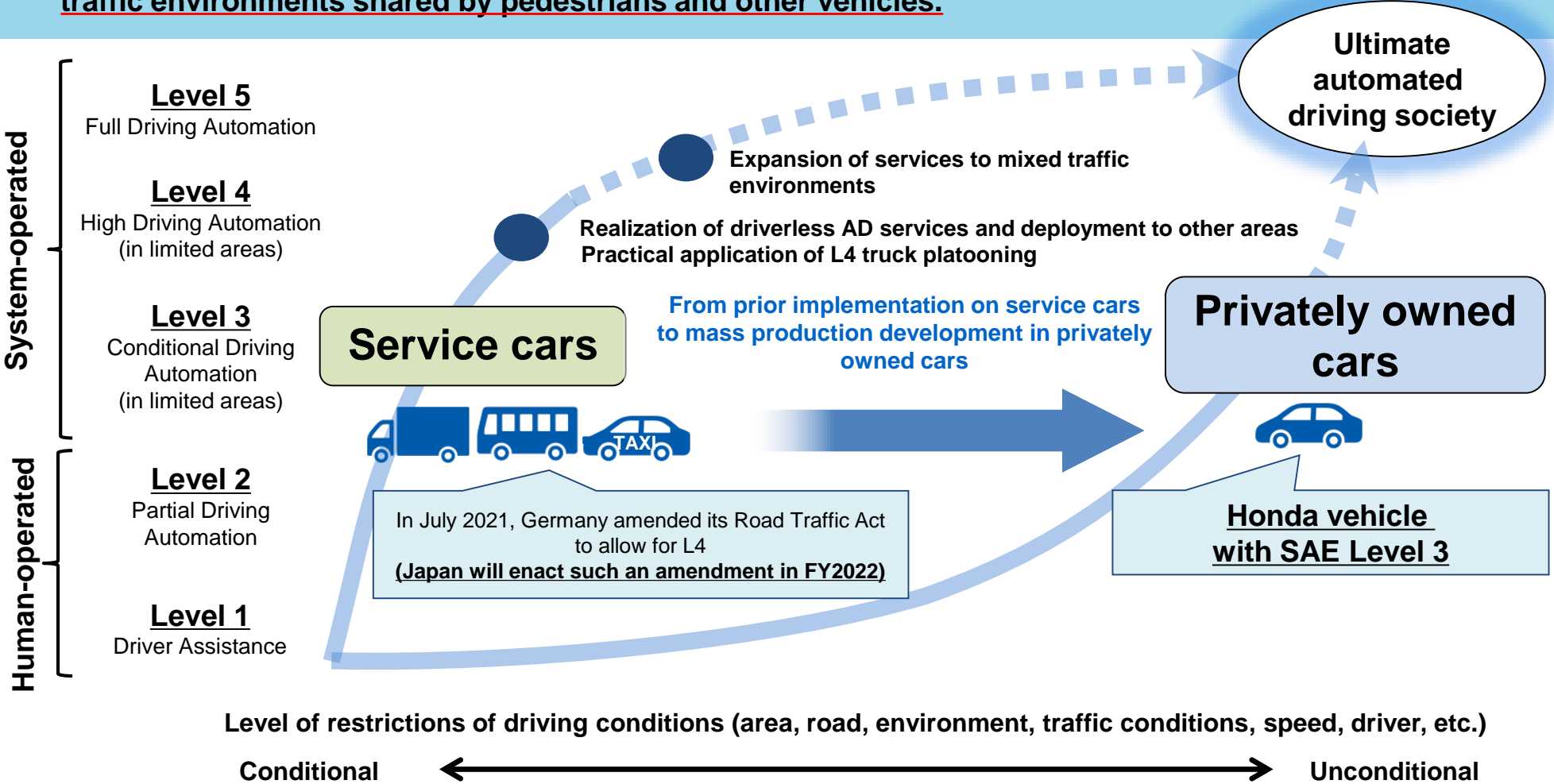
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Efforts for the social implementation of automated driving

- Because there are many existing issues before full driving automation (Level 5) can be achieved, this project (RoAD to the L4 project) seeks to first implement L4 in service cars for which driving conditions can be more easily controlled. On April 19, 2022, Japan followed Germany by amending its Road Traffic Act to allow for L4 automated driving, with enactment scheduled for FY2022.
- By FY2025, the “Road to the L4” project aims to establish driverless AD services in over 40 locations, as well as the practical application of L4 trucks on expressways and an expansion of services to mixed traffic environments shared by pedestrians and other vehicles.



Issues to be resolved in order to realize of driverless AD services

- To ensure the steady social implementation of driverless AD services in 40 locations by 2025, it may be necessary to undertake efforts focused on the following issues while considering international trends.

Accelerated commercialization

Cost aspects:

- Support measures for early adopters of automated driving must be considered after the advantages of AD services and their initial costs/running costs have been clarified.
- To ensure the provision of sustainable mobility services, MaaS must be combined with automated driving to enable the efficient operation such services while stimulating the need for such new types of mobility.

Environmental improvements (infrastructure, legal developments, etc.)

Securing and developing human resources for L4:

- In addition to providing system- and HR-related support for bus and taxi operators, methods of securing and training the human resources necessary for automated driving, such as remote operators and on-board maintenance personnel, must be considered.

Construction of a sustainable business framework:

- A business framework that includes such aspects as the development and maintenance of services must be constructed to enable the sustainable operation of such services in local regions.

Methods of linking infrastructure:

- The roles of infrastructure and vehicles in mixed traffic environments where single-vehicle operation poses a challenge must be clarified.

Technological developments

Development of elemental technologies:

- Elemental technologies for automated driving must be developed, such as software and sensors for L4.

Sophistication and standardization of technical aspects:

- Remote monitoring systems and schemes must be constructed to enable more vehicles to be monitored simultaneously in an efficient manner.
- Methods of evaluating the safety of automated driving systems must be constructed and internationally standardized.

Increased social acceptance

Gaining the understanding and cooperation of relevant parties in local regions:

- In order to gain the understanding and cooperation of relevant parties in local regions, templates for smoothly and safely implementing AD services (e.g., safety assessments, safety reports) must be created.

Clarification of roles between relevant parties:

- Demarcation points between the roles and responsibilities required of relevant parties must be clarified, as must the roles necessary for constructing a business environment in which matters such as insurance schemes can be resolved smoothly.

By focusing on these issues, R&D and demonstration projects will be carried out in the main driving environments outlined in the "RoAD to the L4".

“RoAD to the L4” Project Overview

- Aimed at the realization and popularization of unmanned AD services, coordination with relevant ministries and agencies in underway in the promotion of "Advanced mobility service research, development and social implementation project for L4 AD, etc. (RoAD to the L4)".
- By FY2025, the “Road to the L4” project aims to establish driverless AD services in over 40 locations, as well as the practical application of L4 trucks on expressways and an expansion of services to mixed traffic environments shared by pedestrians and other vehicles, such as urban areas.

Theme 1: Realization of L4 services in limited locations

- In limited locations and vehicles with remote monitoring (L4) by FY2022



(Image) Remotely operated AD system in Eiheiji Town

Area/vehicle expansion

Theme 2: Support for area/vehicle expansion

- L4 driverless AD services to diverse areas and with various type of vehicles in over 40 locations by FY2025.



(Image) AD buses

Theme 3: Practical application of advanced logistics systems on expressways

- Efforts for practical application of high-performance trucks, including platooning on expressways (around 2025)



(Image) Automated driving on expressways

Support for mixed traffic environments

Theme 4: Establishment of services in mixed traffic environments

Support for mixed traffic environments

- Harmonization and interoperability of infrastructure, V2V and V2P for deployment of L4 AD in more complex mixed traffic environments



(Image) Driving assistance using data from road infrastructure

Theme 1. Demonstration of AD Service with Remote Monitoring (L4)

Target

- Demonstration of an AD Service on Limited Area and Vehicles with **Remote Monitoring (L4) by FY2022**
- **Establish Basic Business Models and Institutional Structure for AD Service with Remote Monitoring (L4)**

Approach Policy

- In limited locations such as discontinued railway sites using low-speed vehicles.
- Study the roles of remote operators and their tasks other than establishing driving technology and the commercial deployment of remotely monitored L4.



Main Activities

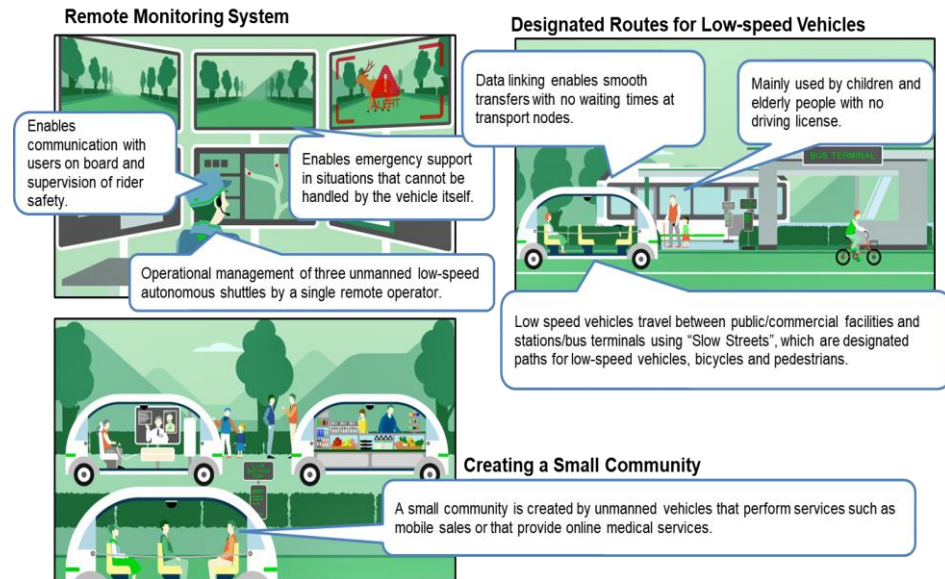
2021

- Organization of business models
- Operation, demonstration and evaluation of systems that enables remote monitoring of 3 vehicles by one person
- Demonstration and evaluation of remote operators' task
- Advancement to L4 vehicles and systems

2022

- Analysis and creation of models for the deployment of business models
- Requirements for remote operators to increase the number of vehicles monitored
- Build structures for tasks excluding driving

Future Image



Theme 2 . L4 MaaS Service Expansion for Multiple Area and Vehicle Types, and Improvement of Business Viability

Target

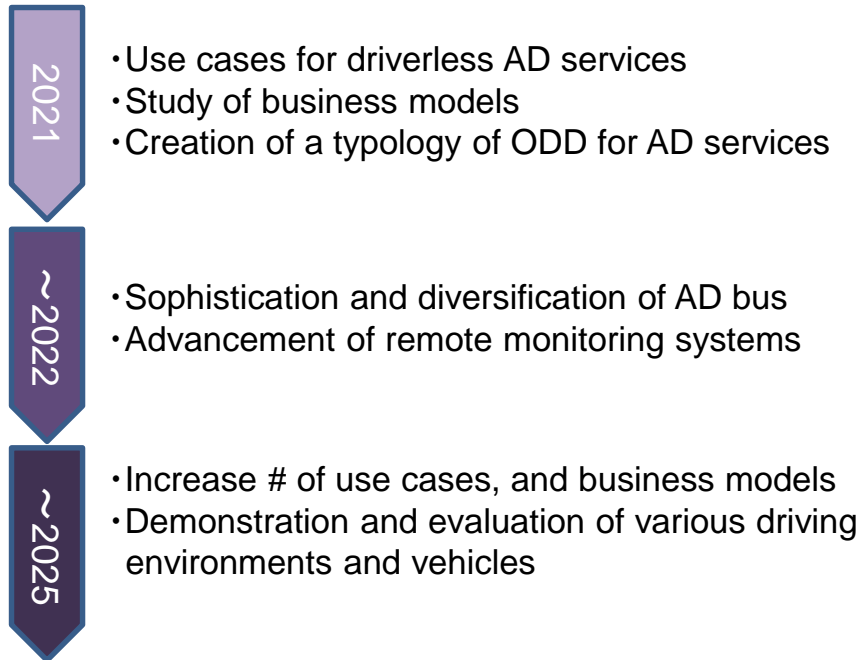
- Deployment of driverless AD services to diverse areas with various type of vehicles (L4) **at over 40 locations by FY2025.**
- Establish business models and infrastructure/institutional structure for the deployment of varied services.

Approach Policy

- Promote the development of vehicles and systems with specification and functions that have appropriate safety for their ODD and operating conditions, assuming AD services in various areas and with various vehicles.
- Promote efficient rolling out of services



Main Activities



Future Image

Lane for Autonomous Vehicles



Small, medium and platooning vehicles stop at island-style bus stops to meet mobility demand at any time of the day depending on user numbers and needs.

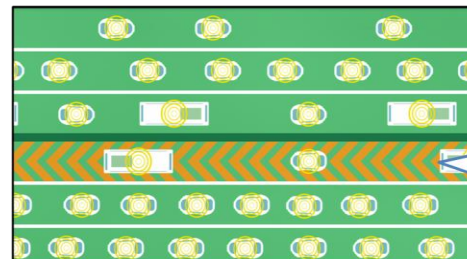
On-board Services on L4 Vehicles



Although vehicles have no drivers, on-board staff assist users in vehicle ingress/egress, while providing other services such as tourist information or the selling of goods.

When emergencies occur that the vehicle cannot handle, a remote operator takes control of the vehicle using ultra-low-latency communication to maneuver it to a safe location.

Dynamic Routing



Vehicles use traffic data exchanged with MaaS to set their routes dynamically in order to avoid heavy traffic or travel restrictions.

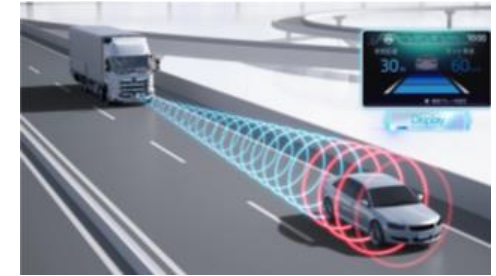
Theme 3. Deployment of High-Performance Trucks including Platooning on Expressway

Target

- **Deploy L4 AD trucks and its platooning technology on expressway after 2025**
- **Develop not only vehicle technologies but also necessary environment such as fleet operation management systems (FMS), infrastructures and data for business implementation**

Approach Policy

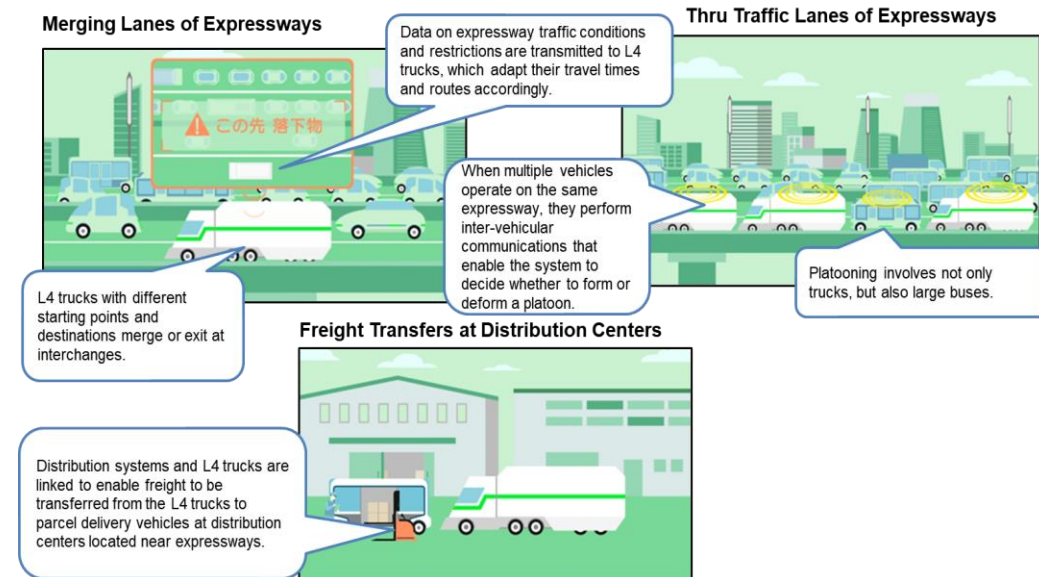
- Development of L4 AD trucks utilizing results of previous demonstration experiments of unmanned truck platooning.
- Development of FMS utilizing infrastructure data that take the needs of large vehicles.



Main Activities

- 2021**
 - Evaluation of business models
 - Development of vehicles and systems to evaluate the ODD of L4 vehicles
- ~2022**
 - Demonstration, evaluation and establishment of ODD concepts and FMS meeting characteristics of large vehicles
- ~2025**
 - Demonstration, evaluation of business models and collaborative driving of multi-brand vehicles
 - Development of systems by private companies

Future Image



Theme 4. Harmonization and interoperability of V2V and V2P communication to achieve L4 in mixed traffic environment

Target

- **Achieve L4 AD services in mixed traffic in diverse areas** using cooperative system by around 2025
- Create a test bed area where the most appropriate cooperative system, which is adapted to the road environments and traffic situations, etc. may be implemented
- Support lower level of automations (L3, ADAS, etc.)

Approach Policy

- Cooperative system in accordance with local characteristics based on analysis and study of regional use cases.
- Promote harmonization and standardization efforts based on domestic and international discussions and technology development



Main Activities

2021

- Use cases and business models
- Study and evaluation of cooperative system
- Study on data exchange schemes

~2022

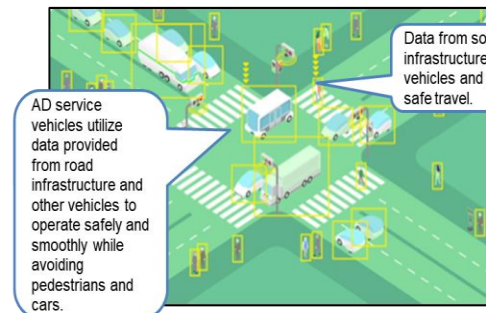
- Identifying specification of data exchange schemes
- Study on standardization and evaluation environment of cooperative system
- International trend and strategies

~2025

- Technical/service/operational/business viability demonstration
- Proposal of standardization and harmonization for cooperative system

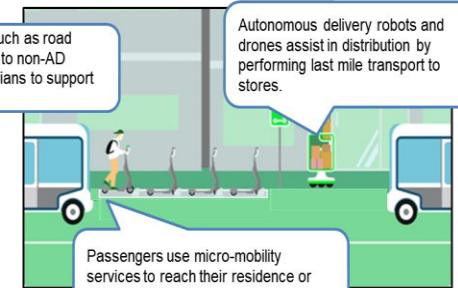
Future Image

Complex Intersections in Large Cities



Data from sources such as road infrastructure is sent to non-AD vehicles and pedestrians to support safe travel.

Last Mile Transport



Active Use of Big Data



Data such as information on the congestion levels at businesses and tourist facilities is also used to provide various services.

Efforts for evaluating the safety of autonomous driving

- If AD vehicles are to be used practically, it is necessary to develop new methods of performing safety evaluations that correspond to how vehicles are operated by AD systems, and which include concepts of conventional safety premised on vehicles being driven by human drivers.
- In addition to examining scenarios for traffic disturbances on expressways, scenarios that systematically combine cognitive disturbances and vehicle disturbances must be considered. Furthermore, in addition to expanding these scenarios to include general roads, studies will be started on the construction of a safety evaluation platform that can be linked with a virtual environment to contribute to the development of AD systems.
- The practical application of a safety evaluation platform that is combined with a virtual environment will also be promoted.

[Image of safety evaluations performed in a virtual environment]



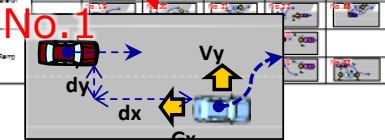
Measurement/data processing



Collection and analysis of traffic disturbance data

Parameter definitions for each scenario

Scenario	Scenario	Scenario	Scenario	Scenario	Scenario
Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6
Scenario 7	Scenario 8	Scenario 9	Scenario 10	Scenario 11	Scenario 12
Scenario 13	Scenario 14	Scenario 15	Scenario 16	Scenario 17	Scenario 18
Scenario 19	Scenario 20	Scenario 21	Scenario 22	Scenario 23	Scenario 24



Creation of test scenarios for safety evaluations

